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I, JULIE BILLINGSLEY, TEAM LEADER EXAMINATION SUPPORT AND SALES hereby certify that annexed is a true copy of the Provisional specification in connection with Application No. 2003900227 for a patent by TRANSCO MANUFACTURING AUSTRALIA PTY LTD as filed on 20 January 2003.

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WITNESS my hand this
Second day of February 2004

J. Billingsley

JULIE BILLINGSLEY
TEAM LEADER EXAMINATION
SUPPORT AND SALES

TRANSCO MANUFACTURING AUSTRALIA PTY LTD

AUSTRALIA

PATENTS ACT 1990

PROVISIONAL SPECIFICATION FOR AN INVENTION ENTITLED:-

"ATTACHMENT MEANS FOR DRILLING EQUIPMENT"

This invention is described in the following statement:-

This invention relates to an attachment means for drilling equipment and in particular to means of attaching cutting elements to the ground drilling or cutting tool.

Some ground drilling or cutting tools comprise one or more cutting elements and it is desirable for those cutting elements to be replaceable. This enables damage to cutting elements to be replaced or worn cutting elements to be removed for re-shaping.

The working conditions for drilling equipment are exceedingly arduous and it is very difficult to construct drilling equipment so that the cutting elements are removable. The most reliable and easiest way of attaching cutting elements to a cutting tool is to fix them in place by welding.

For example, cutting element may comprise a roller cone which is rotatably secured to an arm and the arm is in turn welded to the body of the drilling or cutting tool. A number of such cutting elements may be spaced around the periphery of the drilling or cutting tool.

Welding of the cutting elements to the cutting or drilling tool presents some difficulty in maintaining the cutting element. Massive rotary drilling tools can each have a large number of cutting elements that will each require, on a periodic basis,to be re-shaped. Obviously, in the case of a welded cutting element, the re-shaping must occur with the cutting element in situ. Given that some drilling and cutting tools may be quite large, such an operation becomes quite a task.

In addition, when the cutting elements finally become unserviceable, then it is more likely for the drilling or cutting tool to be discarded in its entirety rather than attempting to rework the tool by removing cutting elements.

Accordingly, it is an object of this invention to overcome the abovementioned difficulties and to provide a means of attachment for cutting elements which enable convenient removal of the cutting element as and when required.

In its broadest form, the invention is an attachment means for a ground drilling or cutting tool that allows cutting elements to be secured to the tool, said attachment means comprising:

a first surface on said cutting element,

a second surface on said tool that mates with said first surface,

a dowel hole in each of first and second surfaces that align,

a dowel that locates in each of said dowel holes,

a channel means on one of said surfaces,

a channel engaging surface on the other of said surfaces that engage said channel means so as to resist rotational forces applied to said cutting element, and

fastening means securing said first and second surfaces together.

Preferably, the first surface on the cutting element is on an arm of the cutting element and it is parallel with the longitudinal or rotational axis of the drilling or cutting tool. Preferably, the channel means is located on the drilling or cutting tool and comprises a U-shaped channel within which the arm of the cutting tool is placed.

Alternatively, the channel means may comprise a slot on the drilling or cutting tool with the engaging surfaces comprising an elongate ridge on the first surface which locates within the slot.

The dowel locates within each of the dowel holes but resists movement in a direction that is parallel to the longitudinal axis of the drilling or cutting tool. Preferably, the fastening means comprises a plurality of bolts which locate through corresponding holes in the first surface and engage in threaded holes within second surface. Preferably, clearance is provided between the holes in the first surface and the bolts so that no shear loading is applied to the bolts. Instead, all shear forces along the

longitudinal axis of the drilling or cutting tool are restrained by the dowel. This prevents damage to the bolts which may in turn create difficulty with disassembly.

In order to fully understand the invention, preferred embodiments will be described. However, it should be realised that the invention is not to confine to the precise combination of elements described in the embodiments and that other variations will be readily apparent to a skilled addressee while remaining within the scope of the invention disclosed in this specification.

These embodiments are illustrated in the accompanying representations in which:

Figure 1 shows an end view of an attachment arm for a cutting element,

Figure 2 shows a plan view of a first surface on the arm of a cutting element shown in Figure 1,

Figure 3 shows a dowel,

Figure 4 shows a cross section view of the drilling or cutting tool which illustrates the attachment of the arms shown in Figures 1 and 2 to the body of the drilling and cutting tool,

Figure 5 shows a second embodiment of the invention which comprises a mounting box shown in cross section,

Figure 6 shows a plan view of the mounting box shown in Figure 5,

Figure 7 shows a dowel, and

Figure 8 shows a cross section view of a drilling or cutting tool that shows the attachment of the mounting box shown in Figures 5 and 6 to the body of the drilling or cutting tool.

The embodiments described in Figures 1 to 8 are generally used in relation to a drilling or cutting tool similar to that described in an earlier application PCT/AU01/01260. The drilling or cutting tool described in that application is known as a hole opener or hole reamer. The cutting tool acts to open a small diameter hole to a larger diameter and uses five roller cone cutting elements to achieve cutting of the rock or earth. This invention relates to the attachment of those roller cone cutting elements to the main body of the hole opener.

Figure 1 shows an end view of an arm of one of the cutting elements. As seen in Figure 2, the arm has a length which is approximately one and a half times its width. The arm has a first surface 10 which is substantially planar. The arm has engaging surfaces 11 either side of the first surface 10.

A pair of dowel holes 12 are drilled into the first surface 10 and are spaced along the central longitudinal axis with the arm. Bolt holes 13 are drilled either side of each dowel hole 12 and are counter sunk. The diameter of the hole below the counter sink area is larger than the diameter of the bolt to provide clearance between the body of the bolt and the hole. Dowel 14 locates within each of the dowel holes 12 in the manner described below.

Referring to Figure 4 the drilling or cutting tool 15 illustrated has three mounting points 16 for attaching each drilling element. Each mounting point 16 comprises a second surface 17. The second surface 17 together with side walls 18 form a channel into which the arm of the cutting element locates. The engaging surfaces 11 abut against the side walls 18 when the arm of the cutting element is engaged within mounting point 16.

Four bolts 20 are used to secure the arm within the mounting point 16. The bolt aperture 21 within the arm provides clearance between the shaft of the bolt 20 and the hole wall 21. A counter sink 22 is provided for location of the head of each bolt 20.

The second surface 17 is provided with a pair of dowel holes 23. In order to assemble the attachment means, the dowels 14 are located within the dowel holes 23 and the arm is located within the mounting point 16 so that the first and second surfaces 10 and 17 are brought together with the dowels 14 located within dowel holes 12. The bolts 20 are then threadably engaged within the body of the tool 15.

In order to relieve the bolts 20 of further load, dowel pins 24 can be located in a longitudinal aperture from between the engaging surface 11 and the side wall 18. Preferably, the dowel pin 24 has a light interference fit within the longitudinal aperture so that it is the primary load bearing member to ensure that the bolts 20 do not have excessive tensile forces applied to them.

In this way, the bolts 20 do not have excessive shear or tensile loads applied to them. This in turn means that the bolts are more likely to be easily removed as less damage will be caused to both the bolts 20 and threaded apertures within which they locate.

The engaging surfaces 11 abut against the side walls 18. Accordingly, rotational forces applied to the cutting element will be resisted by the surfaces. Any longitudinal forces will be resisted by the dowels 14.

A second embodiment is shown in Figures 5 to 8. In this embodiment, a mounting box 26 is mounted directly to the drilling or cutting tool 15. The mounting box 26 has a central channel 27 comprising a base wall 28 and side walls 29. In this embodiment, the arm of a cone roller cutting element is welded into the channel 27.

The mounting box 26 has a first surface 10 that abuts against a second surface 17 on the cutting tool 15. The second surface 17 has a channel means which in this embodiment comprises a longitudinal slot 30 the first surface 10 has a longitudinal ridge 31 that locates within the slot 30. The ridge 31 has channel engaging surfaces 32 that engage into the edges of the slot 30.

The mounting box 26 has two dowel holes 33 for location of dowels 34 therein. The dowels 34 also locate within dowel holes 35 within the body of the tool 15.

The mounting box 26 has four bolt holes 37 with counter sink 38. The body of the tool 15 has threaded apertures 39 into which bolts (not drawn) locate. As with the previous embodiments, the bolt holes 37 have a larger diameter than the bolts to provide a clearance so that no shear loads are transferred directly to the bolt.

The dowels 34 are placed in position within dowel holes 35 and in the first and second surfaces 10 and 17 are brought together. The dowel 34 locates into the dowel hole 33 in the mounting box 26. At the same time, the ridge 31 locates within slot 30. The bolts are then inserted to secure the cutting element to the body of the tool 15. The dowels 34 resist any longitudinal load applied to the cutting elements and the rotational loads are resisted by the channel engaging surfaces 32 engaging against the side surfaces of the slot 30.

With both of the embodiments it is possible to easily remove the cutting elements for either replacement or maintenance work. As no loads are directly applied to the four bolts holding the cutting element to the tool, there is less possibility of damage being caused to the bolts resulting in them being difficult to remove.

DATED this 20th day of January, 2003.

TRANSCO MANUFACTURING AUSTRALIA PTY LTD
By its Patent Attorneys
MADDERNS

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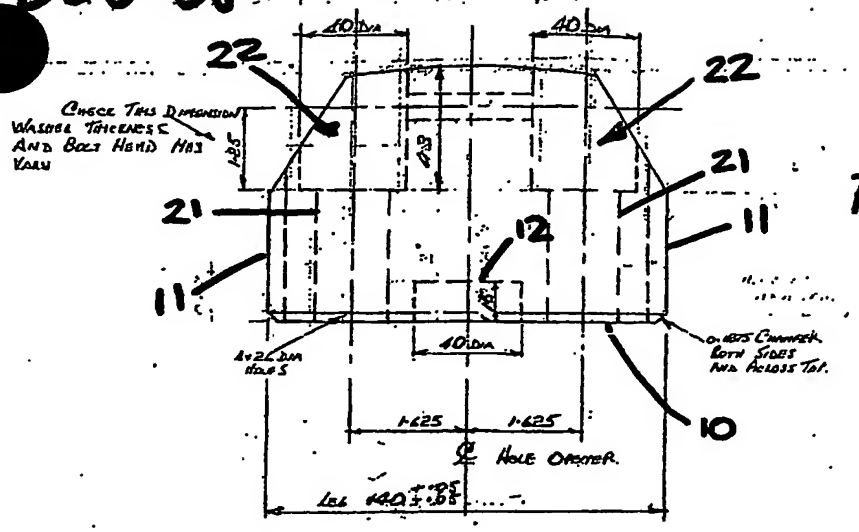

Fig 1

C57-637 x 22° LEG
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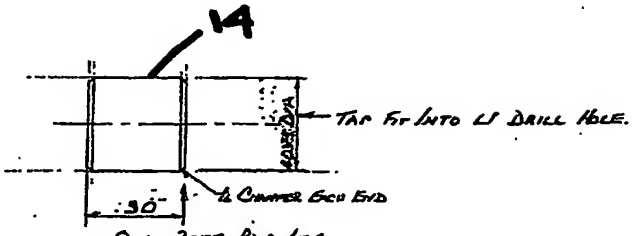


QTY - 2 OFF PER LEG.
MAT - AISI 4140

Fig 3

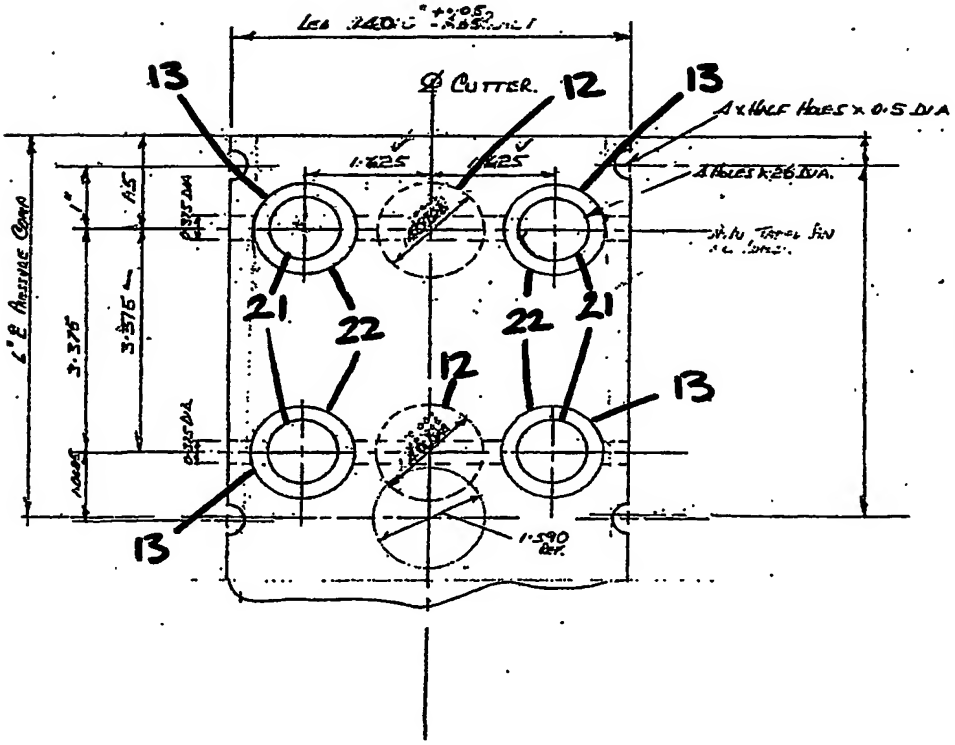


Fig 2

TRANSCO MANUFACTURING Lonsdale, South Australia 5160 Phone: (08) 328 5599 Fax: (08) 328 1294			
Job Description: R.B.I - 22° C57 - 637 LEG. WELDING DETAILS TO SUIT 12A 24" x 3 CUTTER HOLE OPENER			
A.J.L. No. 008-21245	Drawn LF	Appd	Date 3/8/01
Customer A.F. LUCAS	Drawing No. H-030-08		Sht-Qty

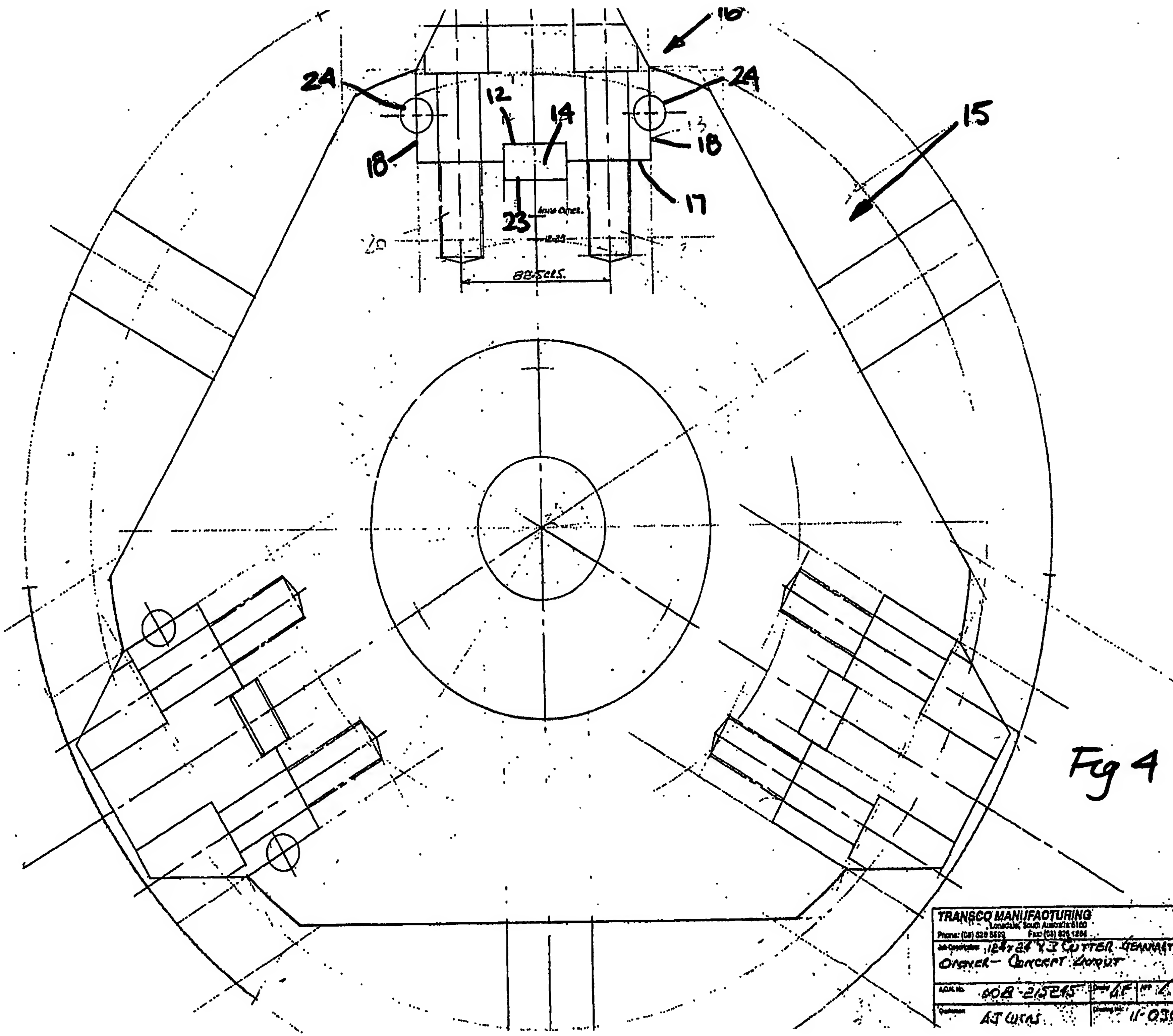
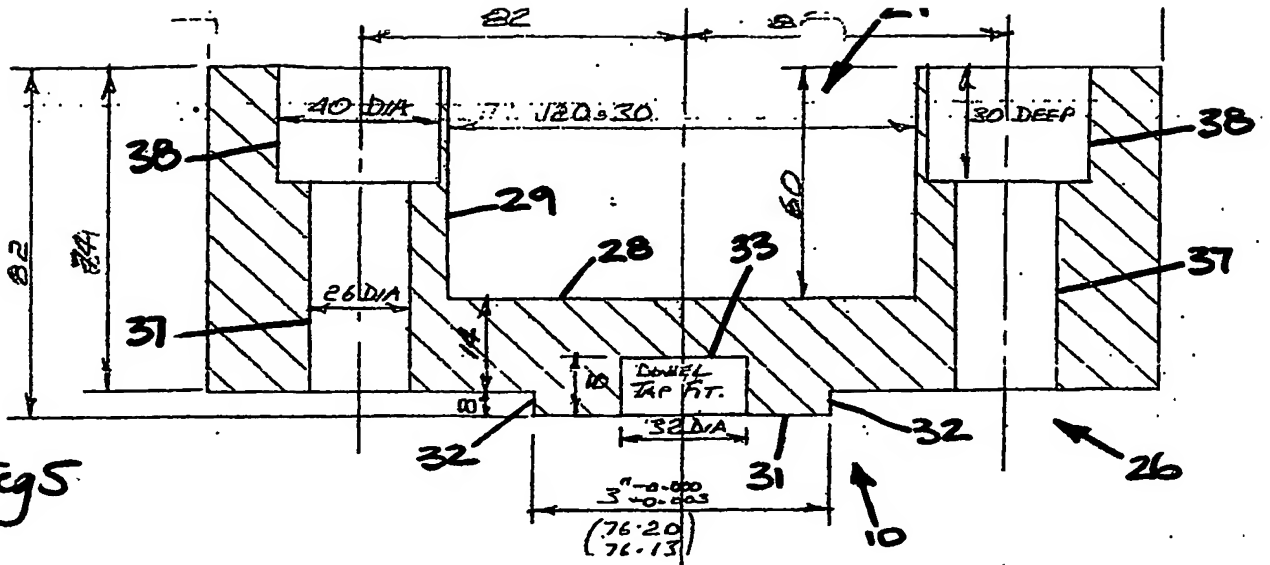


Fig 4

TRANSCO MANUFACTURING
Lonsdale, South Australia 5160
Phone: (08) 326 5899 Fax: (08) 326 1294
Job Description: 12¼" & 24" Y.J Cutter Geomaxt Hole Opener – Concept Layout
A.C.M. No. 00B 215245
Customer: AJ Lucas
Drawing No. 11-030-04



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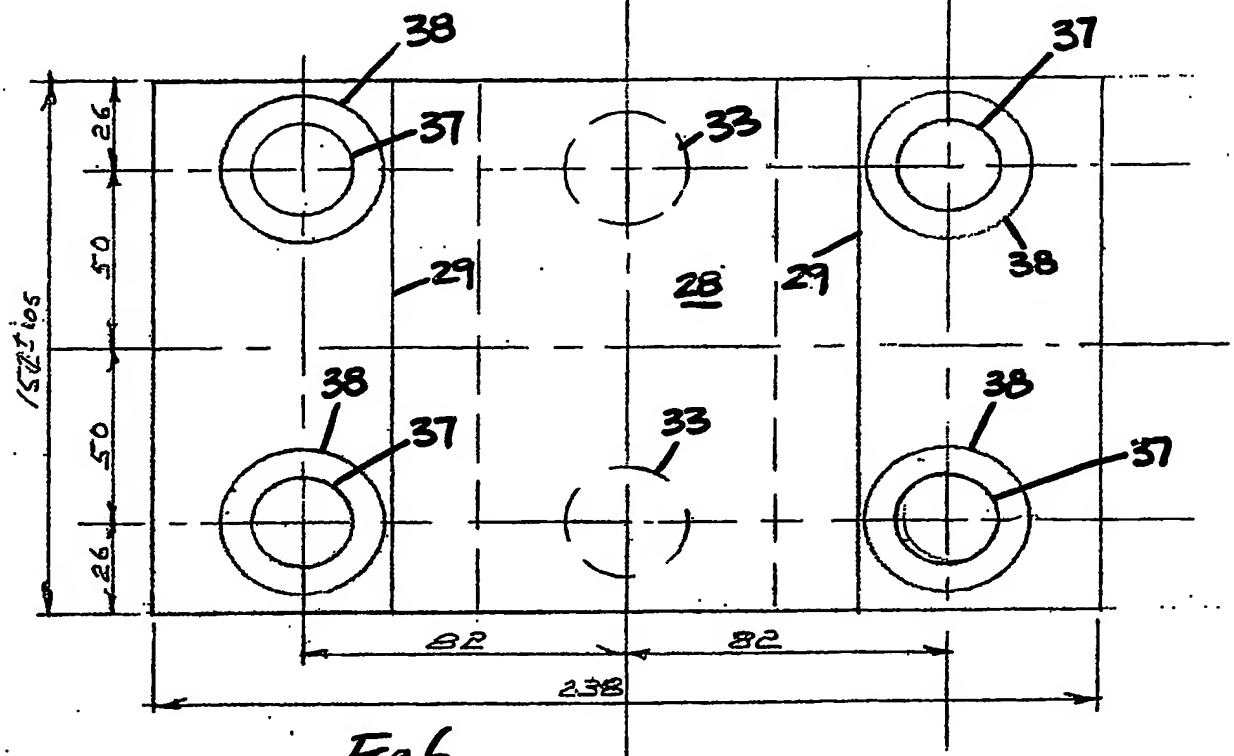

Fg6

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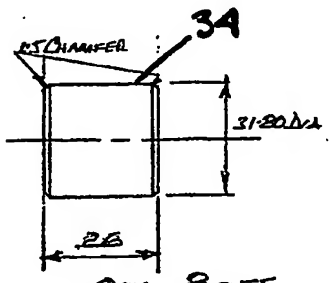
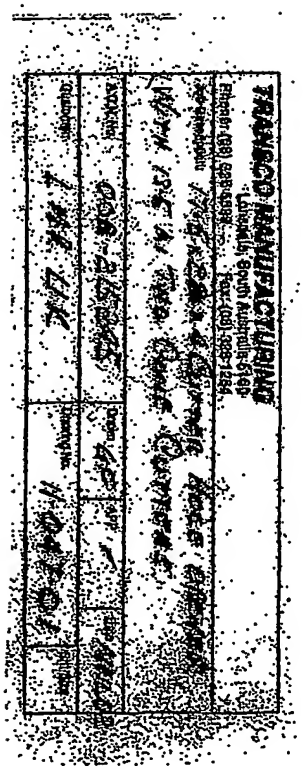
MAT - BISALLOY 80
EX - 100 PLATE.



Fg 7

QTY - 8 OFF
MATERIAL AISI 4140



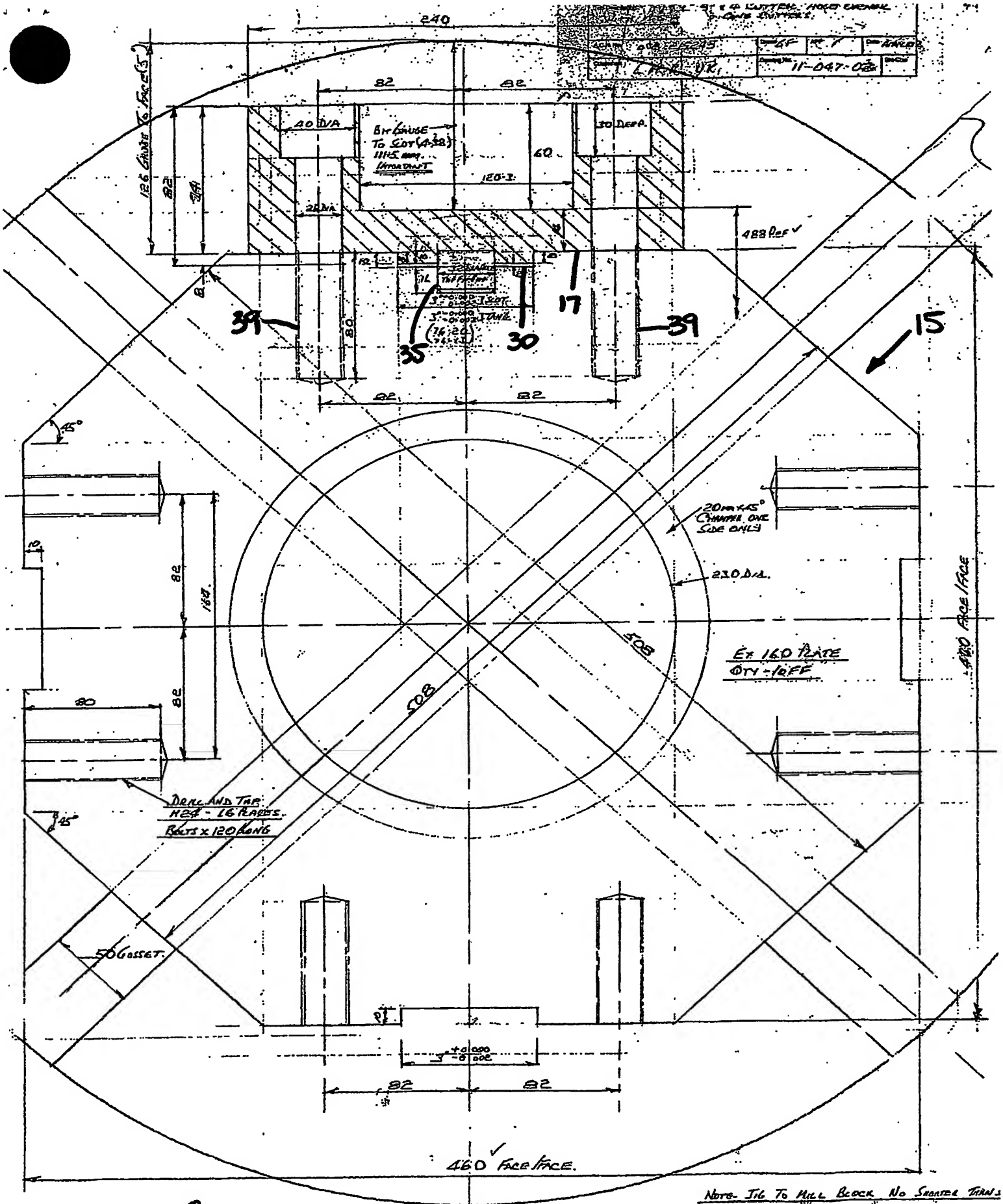


Fig 8.

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17 x 28 x 20

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